MODRET 7.0

WHAT'S NEW IN VERSION 7.0

The new MODRET, Version 7.0 program was fully integrated into the latest Microsoft Windows Environment. Similar to previous versions, the model is capable of generating runoff hydrographs by various methods, and for default or user specified rainfall distribution data. However, for this version, a manually created hydrograph (i.e., slug load hydrograph or non-conforming hydrograph) option was added to allow flexibility to model unusual runoff conditions. Also, an option to create a back to back storm hydrographs was added to allow modeling of ponds assuming back to back storm events. In addition, the model now has an option to add discharge from an upstream pond to a downstream hydrograph. For FDOT pond analysis, the **hydrograph module** now allows generation of batch runoff hydrographs for a series of FDOT rainfall distributions.   This allows to conduct infiltration analyses by selecting the batch hydrographs and allowing the model to run the series automatically.   The manual input of runoff in the Infiltration Module has been eliminated to simplify data entry.

The **Infiltration module** has been changed to enter a stage-area table and allow the model to calculate the average pond area and effective pond volume. This eliminates erroneous entry of pond data and allows automatic routing of the inflow and infiltration for every model run. **The routing module** in this version has been eliminated and the routing was integrated into the infiltration module for automatic routing. The routing has been further improved to extend the routing time beyond the storm event as specified by the user. The routing in the infiltration module now allows determination of peak discharge rates and peak water elevation in the ponds, using runoff, infiltration and stage-storage data every time the infiltration module is executed. The model generates discharge hydrographs, as wells as a number of cumulative hydrographs, such as runoff volume, infiltration volume, stage. Graphic presentation of all hydrographs and modeling results are provided. The MODFLOW model is a modified version that allows weir flow and orifice flow from retention ponds. A brief description of the three modules of MODRET follows:

Hydrograph: This module allows generation of stormwater runoff hydrograph using the SCS Unit Hydrograph, the Rational Hydrograph, and the Santa Barbara Urban Hydrograph and the Manual Runoff Volume methods. The rainfall distribution data are selected from a list of 21 options, of which 19 are fixed distributions (selected SCS, FDOT and other Florida distributions) and the last two (2) are **changeable** distribution options, which can be specified by the user. The limitations of this module are that it can only generate a runoff hydrograph for a single watershed. However, the Infiltration module for this version was developed to accept runoff hydrograph from other models, such as AdICPR^{TM}, SMADA, CHAN or other similar commercially available models. The format of the runoff hydrograph is very simple (text format) and can be adapted from various sources. The changes/additions in this version include:

1. The generation of batch hydrographs for the FDOT series. These are 8 sets of rainfall distributions that often used in Florida to evaluate the controlling rainfall distribution for a particular pond system. This allows selection of the series to create 8 hydrographs and then run them through infiltration module and review the results of all 8 sets without having to model each one individually.
2. An option to create a back to back runoff hydrograph with a specified period between the storms. This option was added to create a hydrograph for 100-year storm events where recovery of the first storm can not be achieved within the specified period of time. In such cases, the back to back storms are used to assess if the second storm event can be retained within the pond after the specified recovery period.

3. An option to add a discharge hydrograph from an upstream pond to the runoff hydrograph of the downstream pond. This option was added to allow modeling of multiple ponds in series by adding the discharge from one pond to the next.
4. A manual input option to create a slug load hydrograph or a non-conforming runoff hydrograph was added. This allows creation of a single slug load hydrograph that can be used to model recovery of the pollution abatement volume. Alternatively, for complex or non-conforming type runoff, a manual time vs runoff volume can be entered in a table format to create a hydrograph.

Infiltration: This module is the main part of MODRET, which includes calculation of infiltration losses from the pond with specified overflow structures and orifices. The data entry in this version has been significantly changed from the previous version, where the initial data set is the stage-area table. The stage-area data can be entered manually or copied from "clipboard". The "Copy from Clipboard" option allows creating the stage-area data set in a spreadsheet, then simply copy and paste.

The pond and aquifer input data lines now have a graphical representation for each field being entered to allow the user better understand each parameter. At the top of the screen a new option "zero infiltration solution?" allows running the model and routing the runoff through the pond where infiltration losses are excluded. This option allows the user to assess the effects and the magnitude of the infiltration losses by comparing results with and without infiltration. The pond volume and average area of the pond is now calculated by the model, using the remaining parameters entered by the user.

Once the user enters the pond, aquifer and overflow characteristics, the model calculates unsaturated infiltration, sets up MODFLOW data files, executes the MODFLOW program for saturated infiltration, reads the results, and calculates and displays the results. The MODFLOW model was specifically modified for use with the MODRET model, which incorporates modeling of weir and orifice overflow or overflow based on manually specified elevation vs discharge relationship (rating curve).

The routing in this version has been integrated into the Infiltration Module where every infiltration model run is automatically routed using the specified stage-storage data of the pond. The routing module allows determination of maximum (peak) discharge rate for the storm event and the maximum stage (water elevation) for the pond as well as water elevations of the pond from start to full recovery or maximum routing time specified by the user. In addition, the module produces electronic file (hydrograph) of instantaneous discharge rate. **The discharge rate** hydrograph is saved in the same format as the runoff hydrograph and can be used as input in a downstream pond or optionally added to runoff hydrograph in the Hydrograph Module.

Cross Section: This module allows for creation of a Cross-Section Graphic, which displays a series of cross sections of groundwater elevations through the retention pond along X and Y axes. The X and Y axes originate at the center of the pond. This option allows a quick review of the shape and extent of groundwater mounding within, and in the vicinity of, the retention pond. The location and extent of the cross section can be selected by the user from a series of default data set. The graphical display of the cross section can be edited by the user, in terms of selecting the extent of the X and Y axes.